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10/629,415	07/29/2003	Todd R. Burkey	3916	5964
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EXAMINER				
CAMPOS, YAIMA				
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

### Office Action Summary

**Application No.**

10/629,415

**Applicant(s)**

BURKEY, TODD R.

**Examiner**

YAIMA CAMPOS

**Art Unit**

2185

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 07 July 2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-5, 7, 9-10, 13, 16-24 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 7, 10, 13 and 16 is/are allowed.
- 6) ☒ Claim(s) 1-5 and 17-24 is/are rejected.
- 7) ☒ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SF/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

### DETAILED ACTION

1. As per the instant Application having Application number 10/629,415, the examiner acknowledges the applicant's submission of the amendment dated July 7, 2008. At this point, claims 1-2, 4, 7, 10, 13 and 16 have been amended, claims 6, 8, 11-12, 14-15 have been cancelled and claims 17-24 have been added. Claims 1-5, 7, 9-10, 13 and 16-24 are pending.

### **REJECTIONS NOT BASED ON PRIOR ART**

#### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claims 1-3, 9 and 17-24 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

3. Applicant's Specification does not provide support for the limitations of "reporting respective new sizes of each of the at least one destination virtual disk before reporting a new storage size of the source virtual disk" since Applicant's Specification recites [**"then changing the Virtual disk size of all mirror destinations and finally changing the Virtual disk size of the source. At this point, the OS(s) can scan the Virtual Disk and detect the new size and start using the full amount of 15 space"** (page 12, lines 12-15) and **"A request is made to**

expand V1 320 to 150 MB. A third RAID partition R3 340 of 50 MB is created and attached to the source VDisk, i.e., V1 320 (but the VDisk size isn't changed at this point). A fourth RAID partition R4 352 of 50 MB is created and attached to the destination VDisk, i.e., V2 330, and the reported size of all the VDIs can be changed at this point" (page 15, line 19- page 16, line 2)]; however, this is not the same as newly added claim limitation of "reporting respective new sizes of each of the at least one destination virtual disk before reporting a new storage size of the source virtual disk".

#### **REJECTIONS BASED ON PRIOR ART**

##### ***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. **Claim 1-2, 9 and 19-24** are rejected under 35 U.S.C. 103(a) as being unpatentable over Lubbers et al. (US 6,880,052) in view of Bridge (US 6,530,035).
6. As per **claim 1**, Lubbers discloses A program storage device readable by a computer embodying in a tangible medium one or more programs of instructions executable by the computer to perform a method for dynamically expanding mirrored virtual disks in a virtual disk storage system, the method comprising: **[increasing the size of virtual disks or logical units (LUNs) in an automated fashion in a copy set or replication environment having source and destination LUNs wherein each LUN has a RAID 0-5 data protection (col. 4, lines 44-**

67; col. 5, lines 59-62)]

receiving by a source virtual disk a request to dynamically expand the mirrored virtual disks which include the source virtual disk and at least one destination virtual disk; [host provides capacity requirements to storage controllers 105 and source LUNs are configured for host access wherein LUNs may be resized according to host requirement (col. 5, line 27-col. 6, line 5) the size of LUNs can be increased/resized in an automated fashion wherein the increase is automatically propagated to other members of a copy set (col. 4, lines 44-67)] associating additional storage with the mirrored virtual disks; [size of LUNs increased by allocating more storage from physical devices (col. 5, line 51-col. 6, line 37; col. 8, lines 5-9)] reporting respective new sizes of each of the at least one destination virtual disk before reporting a new storage size of the source virtual disk; and reporting the new size of the source virtual disk [after the size of the destination is configured and available to received data from source (thus, reported available), the source is quiesced and no writes from host are received by the source, then the source and the destination are associated; the size of the source LUNs is available for writes from host (thus reported available) and the size of the destination LUNs is available for the source to copy data to the destination (col. 4, lines 44-67; col. 6, line 6-37; col. 7, line 64-col. 8, line 29; col. 8, line 57-col. 9, line 8; col. 11, line 66-col. 12, line 12; col. 12, lines 38-51; figs. 4 and 6 and related text)].

To further detail Lubbers, Bridge discloses receiving a request to resize a virtual disk, associating additional storage with the virtual disk and reporting the new sizes users [expanding or shrinking logical volumes by adding or removing extents wherein when the logical volume is configured to a new size, the new size is reported in logical volume directory;

**thus allowing I/O operations are allowed on the logical volume (col. 16, line 32- col. 17, line 4; col. 20, lines 1-33) wherein the added or removed extents may be mirrored (col. 17, line 5-col. 18, line 58)].**

Lubbers and Bridge are analogous art because they are from the same field of endeavor of computer memory access and control.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to modify the system of Lubbers which provides source and destination virtual disks in a copy set and resizes these virtual disks and further explicitly expand the size of the virtual disk by adding new storage and report this by updating directory tables in order to allow I/O access to the virtual disks as taught by Bridge, since Bridge discloses this provides the advantage of dynamically accommodating to system requirement changes in a mirrored system configuration (col. 3, line 45-col. 4, line 59; fig. 9 and related text).

Therefore, it would have been obvious to combine Lubbers with Bride for the benefit of creating a system/method of resizing virtual disks to obtain the invention as specified in claim 1.

7. As per claim 2 The program storage device of claim 1 wherein the request step of associating additional storage further comprises: creating an amount of storage by providing RAID's on each subsystem that is associated with each component of a mirror set; assigning the RAID's to a specific virtual disk for a mirror device; and **[Lubbers discloses each LUN has a specified data protection RAID 0-5 level wherein the data protection level of source and destination may vary (col. 5, line 51-col. 6, line 5; col. 6, lines 16-37)]** specifying a size for the virtual disk and mapping the size of the virtual disk directly to all components of the mirror set **[Lubbers discloses the LUNs in a copy set are mirror and are**

**mapped to physical disks and each LUN has a specified RAID 0-5 level (col. 5, line 51-col. 6, line 37)].**

8. As per claim 19 The program storage device of claim 1, wherein a first of the mirrored virtual disks has a different virtualization configuration from a second of the mirrored virtual disks **[Lubbers discloses source virtual disk and destination virtual disk may each implement different data protection configurations (col. 7, line 64-col. 8, line 29; col. 5, line 51-col. 6, line 37)].**

9. As per claim 20 A method, comprising: receiving a request to dynamically resize mirrored virtual disks, the mirrored virtual disks comprising a source virtual disk and a set of destination virtual disks that includes at least one destination virtual disk; associating additional storage with the mirrored virtual disks; reporting respective new storage sizes of each destination virtual disk before reporting a new storage size of the source virtual disk; and reporting the new storage size of the source virtual disk **[The rationale in the rejection to claim 1 is herein incorporated].**

10. As per claim 21. The method of claim 20, wherein the request is received by the source virtual disk **[host provides capacity requirements to storage controllers 105 and source LUNs are configured for host access wherein LUNs may be resized according to host requirement (col. 5, line 27-col. 6, line 5) wherein host writes to source LUNs (figs. 4-6 and related text)].**

11. As per claim 22 The method of claim 21, wherein, in the step of receiving, the request is received electronically from a host and, in the step of reporting the new storage size of the source virtual disk, the new storage size of the source virtual disk is reported to the host **[Lubbers**

**discloses the size of source virtual disk becomes available for host writes, thus it is reported to host (col. 5, line 26- col. 6, line 5; col. 12, lines 38-51)].**

12. As per claim 23, Lubbers discloses An apparatus, comprising:

a set of mirrored virtual disks, including a source virtual disk and at least one destination virtual disk, the at least one destination virtual disk mirroring the source virtual disk, wherein the source and destination virtual disks have the same size; **[source and destination virtual disks (fig. 4 and related text; col. 7, line 64-col. 8, line 29)]**

a management module that includes a host side interface adapted to *[interpreted as intended use, See MPEP 2106 II-C]* communicating with host devices, through which the management module is adapted by logic to *[interpreted as intended use, See MPEP 2106 II-C]* report the size of the mirrored virtual disks and to receive a request to expand the mirrored virtual disks, and a storage system interface for *[interpreted as intended use, See MPEP 2106 II-C]* communicating with the virtual disks that is adapted to *[interpreted as intended use, See MPEP 2106 II-C]* requesting the source virtual disk to expand and to *[interpreted as intended use, See MPEP 2106 II-C]* obtain reports of the size of the virtual disks from the source virtual disk; and logic adapted to *[interpreted as intended use, See MPEP 2106 II-C]* provide reports of the size of the source virtual disk to the management module through the storage system interface, **[capacity requirements to storage controllers 105 and source LUNs are configured for host access wherein LUNs may be resized according to host capacity requirements (col. 5, line 27-col. 6, line 5; col. 4, lines 44-67) the size/capacity of source virtual disk is available for host accesses and is thus reported (col. 7, line 64-col. 8, line 29)]**



satisfy an expansion request by creating an amount of necessary storage before changing the size that will be obtained by the management module in reports from the source virtual disk; and changing the size that will be obtained by the management module in reports from the source virtual disk **[after the size of the destination is configured and available to received data from source (thus, reported available), the source is quiesced and no writes from host are received by the source, then the source and the destination are associated; the size of the source LUNs is available for writes from host (thus reported available) and the size of the destination LUNs is available for the source to copy data to the destination (col. 4, lines 44-67; col. 6, line 6-37; col. 7, line 64-col. 8, line 29; col. 8, line 57-col. 9, line 8; col. 11, line 66-col. 12, line 12; col. 12, lines 38-51; figs. 4 and 6 and related text)]**.

To further detail Lubbers, Bridge discloses receiving a request to resize a virtual disk, satisfy an expansion request by creating an amount of necessary storage before changing the size that will be obtained by the management module in reports from the source virtual disk; and changing the size that will be obtained by the management module in reports from the source virtual disk **[expanding or shrinking logical volumes by adding or removing extents wherein when the logical volume is configured to a new size, the new size is reported in logical volume directory; thus allowing I/O operations are allowed on the logical volume (col. 16, line 32- col. 17, line 4; col. 20, lines 1-33) wherein the added or removed extents may be mirrored (col. 17, line 5-col. 18, line 58)]**.

Lubbers and Bridge are analogous art because they are from the same field of endeavor of computer memory access and control.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to modify the system of Lubbers which provides source and destination virtual disks in a copy set and resizes these virtual disks and further explicitly expand the size of the virtual disk by adding new storage and report this by updating directory tables in order to allow I/O access to the virtual disks as taught by Bridge, since Bridge discloses this provides the advantage of dynamically accommodating to system requirement changes in a mirrored system configuration (col. 3, line 45-col. 4, line 59; fig. 9 and related text).

Therefore, it would have been obvious to combine Lubbers with Bride for the benefit of creating a system/method of resizing virtual disks to obtain the invention as specified in claim 23.

13. As per claim 24 The apparatus of claim 23, further comprising: a host device adapted to send a request to the management module to expand the mirrored virtual disks [**Lubbers discloses the capacity requirements are sent from host storage device to controllers 105 and source and destination virtual disks are resized accordingly (col. 4, lines 44-67; col. 5, line 27-col. 6, line 5)**].

14. **Claims 3 and 17-18** are rejected under 35 U.S.C. 103(a) as being unpatentable over Lubbers et al. (US 6,880,052) in view of Bridge (US 6,530,035) as applied to claim 1 above, and further in view of Cabrera et al. (US 6,629,202).

15. As per claim 3, the combination of Lubbers and Bridge discloses The program storage device of claim 2, but does not disclose expressly wherein the specifying a size for the virtual disk and mapping the size of the virtual disk is performed by an operating system.

Cabrera discloses specifying a size for the virtual disk and mapping the size of the virtual disk is performed by an operating system as **[logical volumes are mapped and resized under the control of the operating system (col. 8, lines 59-67; col. 10, lines 4-17; col. 11, line 50-col. 12, line 33)]**.

Lubbers, Bridge and Cabrera are analogous art because they are from the same field of endeavor of computer memory access and control.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to modify the combined system of Lubbers and Bridge to have the operating system perform the specifying a size for the virtual disk and mapping the size of the virtual disk as taught by Cabrera, since Cabrera discloses this would provide dynamic volume resizing without system disruption.

Therefore, it would have been obvious to combine Lubbers with Bridge and Cabrera for the benefit of creating a system/method to obtain the invention as specified in claim 3.

16. As per claim 17 The program storage device of claim 1, further comprising: providing by the source virtual disk continuous availability for normal disk access operations between the step of receiving a request and the step of reporting the new storage size of the source virtual disk **[Lubbers discloses the host can continuously write to source (col. 12, line 38-col. 13, line 15)]**.

To further detail the combination of Lubbers and Bridge, Cabrera discloses **[logical volumes and their plex are dynamically mapped and resized under the control of the operating system without system disruption (col. 8, lines 59-67; col. 10, lines 4-17; col. 11, line 50-col. 12, line 33)]**.

Lubbers, Bridge and Cabrera are analogous art because they are from the same field of endeavor of computer memory access and control.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to modify the combined system of Lubbers and Bridge to have logical volumes and their plex are dynamically mapped and resized under the control of the operating system without system disruption as taught by Cabrera discloses since this would provide faster and continuous access while configuring/reconfiguring logical volumes.

Therefore, it would have been obvious to combine Lubbers with Bridge and Cabrera for the benefit of creating a system/method to obtain the invention as specified in claim 17.

17. As per claim 18 The program storage device of claim 17, further comprising: providing by the set of destination virtual disks continuous mirroring of the source virtual disk between the step of receiving a request and the step of reporting the new storage size of the source virtual disk **[Lubbers discloses each time data is written to source, a copy operation is scheduled to destination, wherein these copy operations can be scheduled as needed and explains ongoing operations of copying data from the source to the destination can be performed (col. 12, line 57-col. 13, line 15). Cabrera further discloses data is continuously mirrored by first plex component (col. 11, line 50-col. 12, line 33)].**

#### **RELEVANT ART CITED BY THE EXAMINER**

18. The following prior art made of record and not relied upon is cited to establish the level of skill in the applicant's art and those arts considered reasonably pertinent to applicant's disclosure. See **MPEP 707.05(c)**.

19. The following reference discloses allocating/deallocating physical storage devices to a host in units of RAID's wherein a storage pool of continuous storage locations, disk devices, and RAID's is maintained to allocate these physical devices to hosts (fig. 5A and related text).  
Jaskiewicz et al. (US 2003/0061491)

#### **ACKNOWLEDGMENT OF ISSUES RAISED BY THE APPLICANT**

##### **Response to Amendment**

20. Applicant's arguments filed on July 7, 2008 with respect to claims 1-3, 9 and 17-24 have been considered but are moot in view of the new ground(s) of rejection.

#### **CLOSING COMMENTS**

##### ***Conclusion***

21. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event,

however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

**Examiner's Note**

22. Examiner has cited particular columns and line numbers in the references as applied to the claims above for the convenience of the applicant. Although the specified citations are representative of the teachings in the art and are applied to the specific limitations within the individual claim, other passages and figures may apply as well. It is respectfully requested from the applicant, in preparing the responses, to fully consider the references in entirety as potentially teaching all or part of the claimed invention, as well as the context of the passage as taught by the prior art or disclosed by the examiner.

**When responding to this Office Action:**

12. Applicant is requested to indicate where in the disclosure support is to be found for any new language added to the claims by amendment. 37 C.F.R. § 1.75(d)(1) requires such support in the Specification for any new language added to the claims and 37 C.F.R. § 1.83(a) requires support be found in the Drawings for all claimed features.

23. Applicant must clearly point out the patentable novelty which he or she thinks the claims present, in view of the state of the art disclosed by the references cited or the objections made, and must also explain how the amendments avoid the references or objections. See 37 C.F.R. § 1.111(c).

**a. STATUS OF CLAIMS IN THE APPLICATION**

24. The following is a summary of the treatment and status of all claims in the application as recommended by **M.P.E.P. 707.07(i)**:

**a(1) SUBJECT MATTER CONSIDERED ALLOWABLE**

25. Per the instant office action, claims 7, 10, 13 and 16 are allowable and claims 4-5 are deemed to contain allowable subject matter but are not allowable in view of 35 USC 112 rejections above.

The primary reasons for allowance of claims 4-5, 7, 10, 13 and 16 in the instant application is the combination with the inclusion in these claims of the limitation a system/method wherein **“detaching any RAIDs that extend beyond the specified size of the virtual disk”** nor **“truncating RAIDs to free up any excess physical segments back into the RAID storage system”**. The prior art of record including the disclosures under section (RELEVANT ART CITED BY THE EXAMINER) above neither anticipates nor renders obvious the above recited combination.

Note that Lubbers, Bridge and Cabrera discloses shrinking or decreasing a virtual disk size (See REJECTION TO CLAIMS ABOVE) and that Jaskiewicz discloses allocating/deallocating physical storage devices to a host in units of RAIDs wherein a storage pool of continuous storage locations, disk devices, and RAIDs is maintained to allocate these physical devices to hosts (fig. 5A and related text); but these reference or the combination of these references does not anticipates nor renders obvious resizing a virtual disk by **“detaching any RAIDs that extend beyond the specified size of the virtual disk”** nor **“truncating RAIDs to free up any excess physical segments back into the RAID storage system”**.

**a(2) CLAIMS REJECTED IN THE APPLICATION**

26. Per the instant office action, claims 1-3, 9 and 17-24 have received an action on the merits and are subject of a final rejection.

**b. DIRECTION OF FUTURE CORRESPONDENCES**

27. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Yaima Campos whose telephone number is (571) 272-1232. The examiner can normally be reached on Monday to Friday 8:30 AM to 5:00 PM.
28. If attempts to reach the above noted Examiner by telephone are unsuccessful, the Examiner's supervisor, Mr. Sanjiv Shah, can be reached at the following telephone number: Area Code (571) 272-4098.

The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

December 4, 2008

/Yaima Campos/  
Examiner, Art Unit 2185

/Sanjiv Shah/  
Supervisory Patent Examiner, Art Unit 2185